

## **REMARKS**

Original claims 1, 3, 4, 7-11, and 13-31 remain in the case. Claims 2, 5, 6, and 12 have been cancelled. Claims 1, 7, 8, 11, and 29 were previously presented.

### **The Cancellation of Claims 3, 4, 13, and 14**

Applicants have cancelled claims 3 and 4 and claims 13 and 14, as they were not properly narrower than the independent claims from which they depended. Their cancellation is respectfully requested.

### **The Rejection of Claims 1, 3, 4, 7-11, 13-18, and 19-28 under 35 U.S.C. 103(a)**

Claims 1, 3, 4, 7-11, and 13-18 stand rejected as obvious over Miller et al. in view of either U.S. Patent 5,672,795 (hereafter referred to as "Vora et al.") or U.S. Patent 5,271,835 (hereafter referred to as "Gorawara et al."). The Office Action notes that both secondary references disclose separating oxygenates from a hydrocarbon feed by using an X-zeolite and that Gorawara et al. also discloses that the adsorbent is capable of producing a product containing less than 5 ppm of oxygenates, specifically acetone. Claims 19-28 stand rejected as obvious over the same references applied against claims 1, 3, 4, 7-11, and 13-18, and further in view of U.S. Patent 6,395,948 (hereafter referred to as "Hope et al.") which teaches the use of specific ionic liquid oligomerization catalysts which may be employed to carry out Applicants' claimed invention.

The rejection of claims 1, 3, 4, 7-11, 13-18, and 19-28 under 35 U.S.C. 103(a) were essentially the same as in the earlier non-final office action dated November 2, 2004. The arguments filed in Applicants' response dated

January 6, 2005 were not addressed since a new non-final rejection was issued on March 30, 2005.

Applicants' invention resides in the discovery that very small amounts of oxygenates will deactivate ionic liquid oligomerization catalysts which are used to oligomerize the olefins present in Fischer-Tropsch derived feed stocks. To Applicants knowledge this has not been previously reported. As the problem was unknown in the art at the time the invention was made, then the solution to that problem cannot be obvious. While it is well known to dehydrate alcohols to form olefins prior to oligomerization, there is no suggestion in the literature that even small amounts of other oxygenates which may be present in Fischer-Tropsch feed streams will interfere with the oligomerization process when an ionic liquid catalyst is used. Therefore unlike processes taught in the prior art, Applicants' claimed process removes substantially all of the oxygenates present, including ketones, aldehydes, carboxylic acids, and anhydrides, not just the alcohols.

The Differences Between the Claimed Invention  
and the Miller et al. Reference

The primary reference cited by the Patent Office, Miller et al., describes a two step dimerization process for preparing lube base oil from olefinic feedstocks. In the first step a C<sub>5-11</sub> olefinic feed is dimerized to a C<sub>10-22</sub> intermediate product which in turn is dimerized in the second step to a product boiling in the base oil range. The first dimerization step is preferably carried out in a fixed bed reactor, such as a found in an MTBE or TAME plant. See column 9, lines 27-31. The preferred catalyst for carrying out both the first and second dimerization is a nickel ZSM-5 catalyst. See column 1, lines 40-51. In column 1, lines 31-35, Miller et al. specifically states that the process disclosed in the reference is intended as a method for the production of lube base oil using a MTBE or TAME plant. None of this has anything to do with Applicants' claimed invention. Applicants' process is a single step

oligomerization process which does not use either a fixed bed or a solid catalyst.

Miller et al. fails to appreciate the need to remove substantially all of the oxygenates present prior to oligomerization when an ionic liquid catalyst is utilized, including ketones, aldehydes, and anhydrides. The primary reference describes the use of a purification zone prior to oligomerization in order to remove "oxygenates and other impurities" in column 5, lines 43-49. Methods mentioned for use in the purification zone include hydrotreating, dehydration, adsorption, and extraction. Hydrotreating is the only purification method described in any detail and appears to be the preferred method for removing impurities. The only adsorbent for removing oxygenates mentioned in the reference is acid clay.

The dimerization steps described in Miller et al. are preferably carried out in a fixed bed reactor which, of course would not be suitable for use with an ionic liquid catalyst. The preferred catalyst used by Miller et al. is a nickel ZSM-5 catalyst although other solid catalysts are exemplified. The only mention of an ionic liquid catalyst is a single entry in column 9, lines 39 and 40 where they are mentioned as part of a catalogue of acid catalysts having dimerization activity.

The general description contained in Miller et al. certainly does not put the public in possession of Applicants' claimed invention nor would it suggest Applicants' claimed invention to one skilled in the art. In order to overcome the deficiencies of Miller et al. the Office Action has combined the primary reference with the secondary references Vora et al., Gorawara et al., and Hope et al.

### The Secondary References

#### Vora et al. and Gorawara et al.

Both Vora et al. and Gorawara et al. describe processes for the production of ethers, principally MTBE or TAME, or alkylates. Neither process remotely resembles the process claimed by Applicants for producing high quality lube base oils or diesel fuel. The feedstocks used in both references are cracked gasoline, the catalyst used is a solid supported catalyst, and the products are ethers or alkylates. The only relevance of these references to the present invention is that they teach that certain adsorbents, most particularly 13X zeolite, may be used to remove polar compounds from hydrocarbon streams. The two references teach nothing about the oligomerization of olefins in general or the use of an ionic liquid oligomerization catalyst in particular. They certainly do not teach the importance of removing substantially all of the oxygenates present in an olefin feed stream prior to using an ionic liquid catalyst in an oligomerization process. As such, Vora et al. and Gorawara et al. fail to overcome the deficiencies of Miller et al.

It is submitted, that there would be no basis for one skilled in the art to combine the teachings of Vora et al. and Gorawara et al. with that of Miller et al. without an understanding of the importance of removing substantially all of the oxygenates present in the feed when an ionic liquid catalyst is employed.

#### The Secondary Reference Hope et al.

Hope et al. teaches the importance of carrying out the polymerization of alpha olefins in the absence of a diluent, such as hexane, when producing a very high viscosity polyalphaolefin. This reference was cited in the Office Action as teaching the use the specific ionic liquid catalyst which represents the preferred oligomerization catalyst used in Applicants' invention. However, as with Vora et al. and Gorawara et al., Hope et al. fails to overcome the

deficiencies of Miller et al. Hope et al. does not even mention oxygenates or describe methods for their removal in his discussion. This is not surprising since the feed stocks employed in the process of Hope et al. are pure alpha olefins which would not contain any oxygenates, unlike the Fischer-Tropsch condensate feeds of the Applicants' invention. In addition, the processes of Miller et al. and Hope et al. are sufficiently different that even by picking and choosing among the various teachings of the primary and secondary references, one skilled in the art would not be led to Applicants' invention.

### Conclusion

Applicants have argued that Miller et al. fails to teach the essence of Applicants' invention in that the primary reference does not recognize the importance of removing substantially all of the oxygenates present from a Fischer-Tropsch olefinic feed stream when an ionic liquid catalyst is used to oligomerize the olefins. Prior to the Applicants' invention the problem of very small amounts of oxygenates in Fischer-Tropsch derived condensate causing deactivation of olefin oligomerization ionic liquid catalysts was not known or anticipated.

Applicants have argued that the process of Miller et al. and the problems being solved in the reference are different from the process claimed in the present case and from the problems addressed by the present invention. Miller et al. is really nothing more than a catalogue of information which provides no basis for one skilled in the art to choose those teachings which are relevant to the present invention.

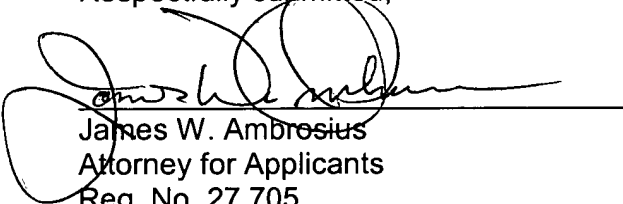
The secondary references, Vora et al. and Gorawara et al., describe adsorbents that are useful in carrying out Applicants' invention, but there is no reason of record for one skilled in the art to employ the adsorbents taught in the secondary references in the process of Miller et al. Likewise, Hope et al. fails to overcome the deficiencies of the primary reference in that it is not concerned with the central problem addressed by Applicants.

Finally, although Applicants have argued that it is improper to pick and choose among the various teachings of the primary and secondary references in the absence of some common thread tying the various elements together, it should be noted that even when the adsorbents taught in Vora et al. and Gorawara et al. are substituted into the purification step described in Miller et al. and the ionic liquid catalyst taught in Hope et al. is incorporated into one or both of the oligomerization steps of Miller et al., one still would not arrive at the process claimed by Applicants. Miller et al. would still remain a two step dimerization process. Applicants' process involves only a single oligomerization step.

It is respectfully submitted that in view of the amendments to the claims in the application, all of the claims remaining in the case are now directed to patentable subject matter, and allowance in due course is respectfully solicited.

The Director of Patents is hereby authorized to charge any fees which maybe required, or credit any overpayment, to Deposit Account Number 03-1620 for the above-referenced patent application.

Respectfully submitted,



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